

THE WING-VENATION OF THE LEPTOPERLIDAE (ORDER PERLARIA), WITH DESCRIPTION OF A NEW SPECIES OF THE GENUS *DINOTOPERLA*, FROM AUSTRALIA.

By R. J. TILLYARD, M.A., Sc.D. (Cantab.), D.Sc. (Sydney), C.M.Z.S., F.L.S., F.E.S., Entomologist and Chief of the Biological Department, Cawthron Institute, Nelson, N.Z.

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The Leptoperlidae are the dominant family in the Stone-fly Fauna of the Southern Hemisphere, numerous species occurring in South America, New Zealand, Tasmania, and Australia. Owing to the fact that they are inert insects, seldom seen flying, and also because most of the species appear in the winter, or early spring, in Australia, very little is known about them here; and it is curious to note that only a single species, *Paranotoperla australica*, End., from south-western Australia, has, so far, been described from the mainland. They are, however, common on all fast mountain streams, and especially abundant in Victoria and Tasmania; while, even in so warm a climate as that of Sydney, at least two species can be taken fairly commonly from July to October.

In a recent paper ("Canadian Entomologist," 1921, pp. 39, 40) I have tabulated the characters of the various families of the Order Perlaria, and have also given a dichotomic key to the same. The Leptoperlidae may be briefly defined as follows:—

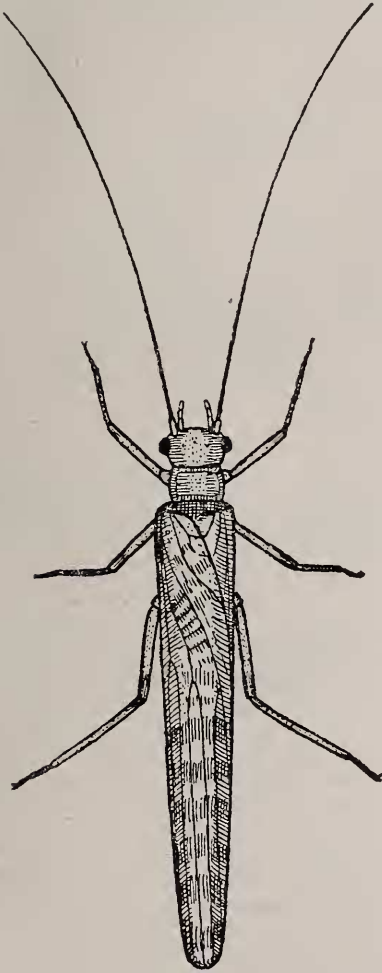
Small to medium-sized stone-flies of a somewhat generalized structure, the mandibles, clypeus, and labrum normal, the palpi with short segments, the anterior coxae placed widely apart, the tarsi with segment 2 shortest, 3 longer than 1, the cerci usually long to moderately long, never reduced to 5 segments or less. In the forewing, Rs is usually either simple or once forked, very rarely three-branched; Cu₁ is simple or forked; 1A is simple; 2A is generally forked, rarely simple.⁽¹⁾ There is no anastomosis or transverse chord in either wing, but the distal half of the forewing, and frequently also of the hind, carries more or less numerous and irregularly placed cross-veins. A complete series of intercubital cross-veins is present in the forewing, together with

(1) It is possible that these veins are 2A and 3A respectively, and that both trachea and vein 1A have disappeared.

either a complete or incomplete series of medio-cubitals. In the hindwing, the anal fan is devoid of cross-veins, and there is always either a complete or incomplete fusion of the posterior branch of M with Cu_1 , the basal piece of $M_3 + 4$ descending transversely on to Cu_1 and appearing like a cross-vein. In the hindwing also, Rs and M are fused basally for some distance, as in most Perlaria.

The Leptoperlidae are all slenderly-built insects. In the position of rest, the wings are rolled round the body, the left forewing overlying the right. The larvae, none of which have so far been described, cling to rocks in running streams, and are remarkable for possessing a unique development of a rosette of gill-filaments around the anus, numbering fifty or more, which can be extruded or withdrawn as required. These gills are usually of a beautiful pink or lavender colour, more rarely whitish.

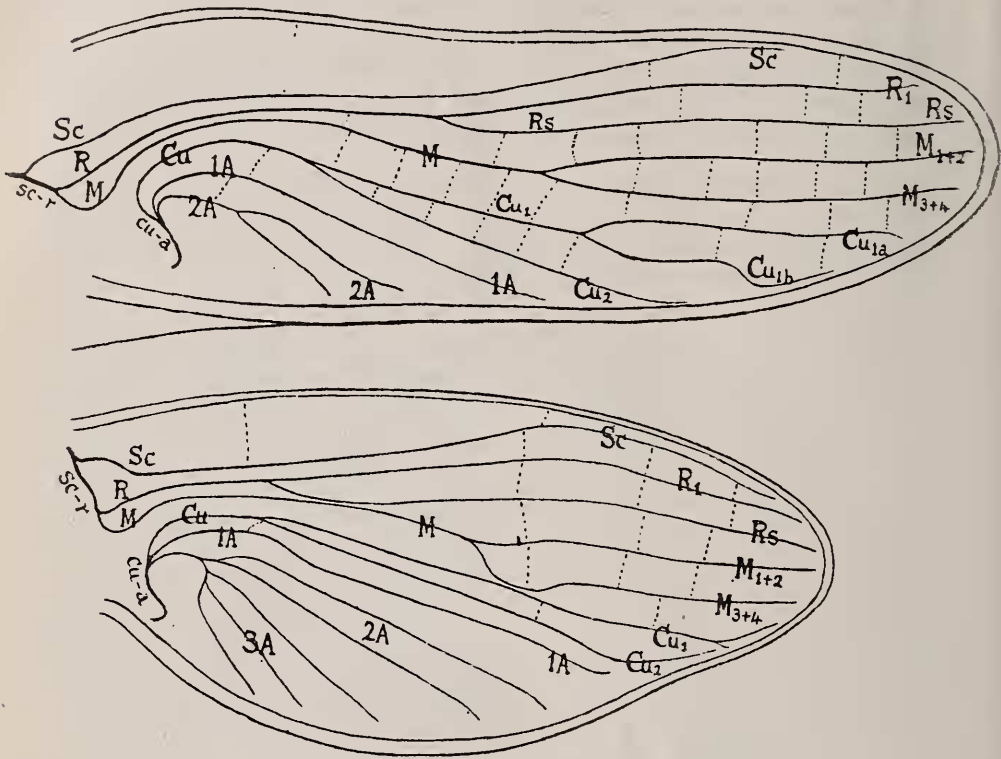
No study has yet been made of the tracheation of the larval wing in this family. While I was living at Hornsby, New South Wales, I discovered a small Leptoperlid larva on the rocks in one of the creeks flowing into Old Man's Valley, and succeeded in rearing the insect, which was found to be a new species of *Dinotoperla*, and will be described in this paper. A study of the wing-tracheation of this larva led to the discovery of the presence of the important specialization mentioned above for the hindwing, viz., that there is always either a complete or partial fusion of $M_3 + 4$ with Cu_1 . The chief purpose of this short paper is to demonstrate this point, as a preliminary to the complete working out of the numerous undescribed genera and species of this family



Text-fig. 1.
Dinotoperla carpenteri, n. sp.
($\times 8$).

The insect in the natural position of rest.

which exist in Australia, Tasmania, and New Zealand, and of which I possess a very large collection.



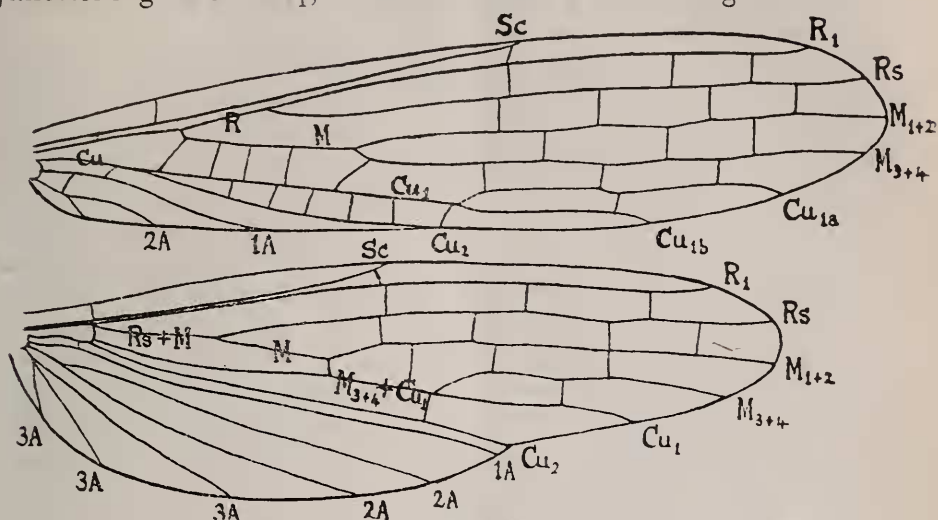
Text-fig. 2.

Dinotoperla carpenteri, n. sp. Tracheation of wings of last larval instar ($\times 48$). For lettering, see text-fig. 3, except *cu-a*, cubito-anal, and *sc-r*, subcosto-radial trunk trachea.

Text-fig. 2 shows the tracheation of the wings in the last larval instar of the Hornsby species, *Dinotoperla carpenteri*, n. sp. By comparing this with the imaginal wing-venation, shown in text-fig. 3, the manner of fusion of $M_3 + 4$ with Cu_1 will be clearly seen. In the larval wing, trachea $M_3 + 4$ comes off obliquely downwards from the main stem of M , runs alongside trachea Cu_1 for a short distance, and then diverges from it again, running freely to the wing margin. In the imaginal hindwing, the free basal piece of $M_3 + 4$ takes on the appearance of a cross-vein descending on to Cu_1 at right angles, and, consequently, the free distal portion of $M_3 + 4$, after its fusion with Cu_1 , appears as if it were a true branch of this latter vein. It would, indeed, be impossible to guess the true condition of these veins without a reference to the precedent tracheation of the larval wing.

The only other genera of Leptoperlidae, so far described from Australia and Tasmania, are *Leptoperla*, Newm., and

Paranotoperla, End. In both of these, M_{3+4} , after junctioning with Cu_1 , remains fused with its right to the



Text-fig. 3.

Dinotoperla carpenteri, n. sp.* Wing-venation ($\times 10$). 1A, 2A, 3A, the three anal veins; Cu, cubitus; Cu_1 , first branch of cubitus, branching, in forewing only, into Cu_{1a} and Cu_{1b} ; Cu_2 , second branch of cubitus; M, media, branching in both wings into M_{1+2} and M_{3+4} , the latter fusing partially with Cu_1 in hindwing only; R, radius; R_1 , its main stem; Rs, radial sector, unbranched in both wings; Sc, subcosta.

wing margin. The three known genera may be easily separated by the following Key:—

- (1) Cerci longer than abdomen; Rs in forewing, with a long fork ... *Leptoperla*, Newm.
- Cerci shorter than abdomen; Rs. in forewing simple ... 2
- (2) Cu_1 in forewing, simple; in hindwing, a complete fusion between M_{3+4} and Cu_1 ... *Paranotoperla*, End.
- Cu_1 in forewing, forked; in hindwing, the fusion between the M_{3+4} and Cu_1 is incomplete ... *Dinotoperla*, Till.

Genus DINOTOPERLA, Till.

"Canadian Entomologist," 1921, p. 43, text-fig. 4b.

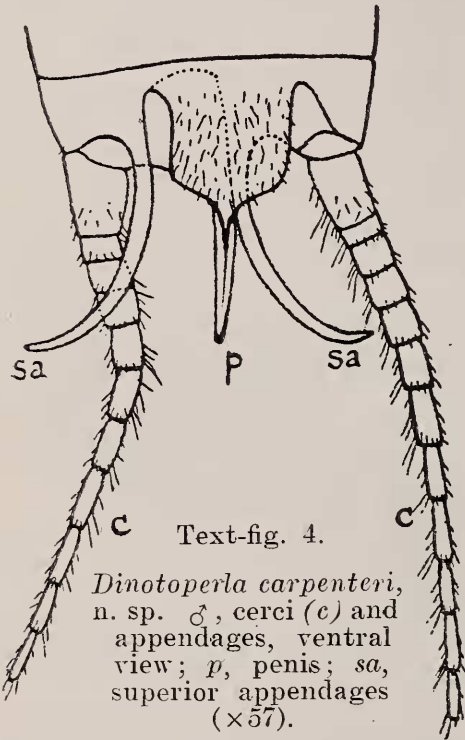
DINOTOPERLA CARPENTERI, n. sp.

Text-figs. 1, 3, 4.

Forewing, 10 mm. Expanse, 21.5 mm.

Head, thorax, and abdomen dull blackish, touched with dark brown behind the eyes and on notum. Eyes brownish-black. Antennae about as long as forewing, very slender, with about 50 segments, the basal one slightly enlarged. Pronotum rectangular, broader than long. Legs dull brownish, the apices of the femora and tibiae darkened; the tarsi darker, except at base of first segment. Cerci rather

short, 10- to 11-segmented, tapering, delicately haired, the basal segment thickest and much longer than any of the next few succeeding segments. In the male, the *superior appendages* are slender, elongated, curved processes, projecting on either side of the penis, the basal portion of which is a broad plate, the distal portion slender and upcurved. The cerci and appendages of the male are figured in ventral view in text-fig. 4. In the female, the ventral plate is deeply bifid, a deep triangular median notch dividing it into two triangular pieces.



Wings: — *Forewing* medium fuscous, with irregular paler subhyaline spaces between the cross-veins; *i.e.*, each cross-vein is surrounded by a rectangle of the fuscous ground-colour, and the spaces between these rectangles are paler. As the positions and number of these cross-veins is inconstant, varying for each individual, the pattern thus produced is very irregular, and is never very conspicuous. *Hind-wing* a uniform medium fuscous. When at rest, the dark and pale areas

of the two wings appear to reinforce one another, giving the insect a distinctly banded appearance, as shown in text-fig. 1.

Dedicated to F. W. Carpenter, M.A., late science master at Sydney Grammar School, in memory of many happy days spent in the field together studying aquatic insects.

Locality:—Hornsby, near Sydney, N.S.W. Bred from larvae found on rocks in a small stream in Old Man's Valley; also found sitting about on the stems of reeds and grass near the stream. July to October.

Types:—Holotype (Hornsby, Sept. 14, 1917, R. J. T.) and series of para-types in Tillyard Collection, Cawthron Institute, Nelson, N.Z.

The set specimens have the abdomens so shrivelled that it is impossible to determine the sex or study the sexual appendages. The descriptions of these organs given above were made from slides prepared from specimens of the para-type series.